



(11)

EP 1 622 228 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.02.2006 Bulletin 2006/05

(51) Int Cl.:
H01R 13/52 (2006.01)

(21) Application number: **05107000.1**

(22) Date of filing: **28.07.2005**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**
Designated Extension States:
AL BA HR MK YU

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(30) Priority: **30.07.2004 IT TO20040533**

(54) **Device for assembling an electric component on a fluidtight pin-contact terminal, in particular of a compressor motor protector**

(57) An electric component, such as a motor protector, is assembled directly on a FUSITE® type, fluidtight, pin-contact terminal having a body projecting partly outwards of a compressor casing, by means of a device including a container made of electrically insulating material and housing the electric component inside a first seat which exposes a face of the electric component facing the fluidtight terminal in use; and an assembly member having a number of gripping members for securing it mechanically to the body of the fluidtight terminal on

one side, and to the container on the opposite side; the assembly member being housed, in use, inside a second seat of the container defining a concavity open on the side facing the fluidtight terminal and for partly receiving the body of the fluidtight terminal with the interposition of a seal; electric contacts being provided, inside the container and at through holes formed through a bottom wall of the second seat, and which include coupling members for electric and mechanical connection to the pin contacts, and which engage the pin contacts when the pin contacts are inserted in the through holes.

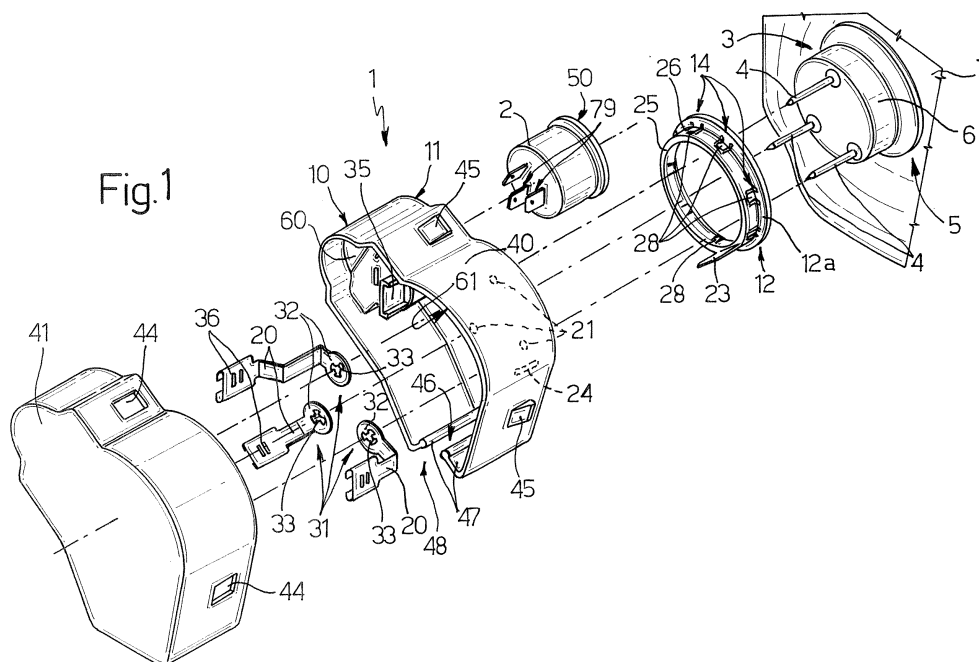


Fig.1

Description

[0001] The present invention relates to a device for assembling an electric component on an fluidtight pin-contact terminal. More specifically, the invention relates to a device for assembling a motor protector on a FUSITE® type terminal fitted partly to the outside of a refrigeration system compressor casing of an electric household appliance, e.g. a refrigerator or freezer.

[0002] As is known, the casings of refrigeration system compressors are made of sheet metal, and are fitted with a fluidtight terminal housed in fluidtight manner in a through seat on the casing to electrically connect the compressor motor windings sealed inside the casing.

[0003] One known type of terminal, marketed by the trade name Fusite®, comprises a cup-shaped body stamped from sheet metal and projection welded to the casing by inserting it through the through seat from inside the casing. A number of (usually three) pin contacts are fitted through a bottom wall of the cup-shaped body, and are embedded in molten glass elements which connect them in fluidtight manner to the cup-shaped body.

[0004] The cup-shaped body of the fluidtight terminal, with the pin contacts, therefore projects partly on the outside of the compressor casing. At the fluidtight terminal, the casing is welded on the outside with a metal supporting bracket (or so-called "Fusite guard") for receiving various electric components for connection to the pin contacts, such as a thermal protector, with the relative terminal board, possibly a starter, etc. The bracket must also have an earth contact for earthing the compressor casing.

[0005] The known structure described above has numerous drawbacks. In particular, it is expensive and complicated to assemble, by involving two separate, successive welding operations (the fluidtight terminal body and the supporting bracket). Moreover, because of inevitable manufacturing and assembly tolerances, the currently used known structure also has the drawback of permitting angular misalignment of the pin contacts and the motor protector and/or the terminal board in which the motor protector is normally integrated, thus increasing assembly cost and, at worst, resulting in rejects. Finally, the two welding operations may result in axial misalignment (i.e. lengthwise of the pin contacts) of the terminal and the bracket.

[0006] It is an object of the present invention to eliminate the aforementioned drawbacks by enabling trouble-free, low-cost assembly of the electric components to the fluidtight terminal on the compressor casing. More specifically, it is an object of the invention to provide a device for assembling an electric component (e.g. a motor protector) on an fluidtight pin-contact terminal, which is cheap and easy to produce and assemble, is long-term reliable and compact, and provides for eliminating the supporting bracket.

[0007] According to the present invention, there is provided a device for assembling an electric component on

an fluidtight pin-contact terminal, as claimed in Claim 1.

[0008] More specifically, the device according to the invention comprises a container made of electrically insulating material and housing the electric component inside a first seat; and an electrically conducting assembly member having a number of gripping members for securing it mechanically to a body of the fluidtight terminal on one side, and to the container on the opposite side; the assembly member being housed, in use, inside a second seat of the container defining a concavity open on the side facing the fluidtight terminal and for partly housing the body of the fluidtight terminal with the interposition of a first seal; electric contacts being provided, inside the container and at through holes formed through a bottom wall of the second seat, said electric contacts comprising coupling members for electric and mechanical connection to the pin contacts, the coupling members engaging the pin contacts when the pin contacts are inserted in the through holes.

[0009] The electric component is preferably a motor protector of a refrigeration circuit compressor, and the fluidtight terminal is a FUSITE® type terminal. The assembly member is in such a case a metal ring having a projecting, preferably blade-type, earth contact insertable inside the container through a slit formed through the bottom wall of the second seat, which is fitted with a second seal.

[0010] A refrigerator or freezer compressor motor protector, housed inside a protective container, can thus be mounted firmly and reliably, while at the same time ensuring electric connection, directly on the fluidtight terminal (FUSITE®) with no need for a supporting bracket. The container may also incorporate the terminal board, or, according to one aspect of the invention, the terminal board may advantageously be in the form of a book-cover holder connected, e.g. by cable, to the motor protector at a distance from the fluidtight terminal.

[0011] The container may be formed to also house, close to the compressor, a starter device in the form of a relay or PTC (positive temperature coefficient resistor) pad.

[0012] A number of non-limiting embodiments of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a three-quarter, exploded front view in perspective of a device for assembling an electric component on an fluidtight pin-contact terminal in accordance with the invention;

Figure 2 shows a view in perspective, rotated 90°, of a component part of the Figure 1 device;

Figure 3 shows a section along line III-III of the Figure 1 device in the as-used configuration, assembled and fitted to a known fluidtight terminal;

Figure 4 shows a view, in direction A, of the device according to the invention assembled;

Figure 5 shows an exploded view in perspective, similar to Figure 1, of a first variation of the device

according to the invention;

Figure 6 shows an exploded view in perspective, similar to Figure 1, of a second variation of the device according to the invention;

Figure 7 shows the same view as in Figure 4 of a further variation of the device according to the invention;

Figure 8 shows further possible components of the Figure 1 device.

[0013] With reference to Figures 1 to 4, number 1 indicates as a whole a device for assembling an electric component 2 on an fluidtight terminal 3 having pin contacts 4. In the non-limiting example shown, electric component 2 is a motor protector for a compressor 5 of an electric household appliance refrigeration system (known and not shown for the sake of simplicity), and fluidtight terminal 3 is of the type commonly known in the electric household appliance industry as a FUSITE®.

[0014] More specifically, fluidtight terminal 3 comprises an electrically conducting body 6 projecting partly outwards of a metal casing 7 of compressor 5, and fitted with pin contacts 4, also projecting outwards of casing 7.

[0015] Device 1 comprises a container 10 made of electrically insulating material and housing electric component 2 inside a first seat 11 (Figure 2); and an electrically conducting assembly member 12 having a number of gripping members 14 for securing it mechanically to body 6 of fluidtight terminal 3 on one side, and to container 10 on the opposite side.

[0016] Assembly member 12 is housed in use (Figures 2 and 3) inside a second seat 15, of the container, defining a concavity 16, which is open on the side facing fluidtight terminal 3 and, in use, partly houses body 6 of fluidtight terminal 3 with the interposition of a first seal 18 (Figure 3).

[0017] Device 1 comprises a number of electric contacts 20 - at least equal in number to pin contacts 4 on fluidtight terminal 3 - housed inside container 10 at through holes 21 (shown by dash lines in Figure 1) formed through a bottom wall 22 of second seat 15.

[0018] In the non-limiting example shown, assembly member 12 is defined by a metal ring 12a having a projecting, preferably blade-type (Faston), earth contact 23 insertable inside container 10 through a slit 24 formed through bottom wall 22 of seat 15.

[0019] Ring 12a has a substantially L-shaped radial section (Figure 3) comprising a sleeve portion 25 which fits, in use, onto body 6 of fluidtight terminal 3; and a flange portion 26, which extends radially outwards of sleeve portion 25, from the end of the sleeve portion facing fluidtight terminal 3 in use, and which, when device 1 is assembled, rests axially against a peripheral edge 27 of second seat 15 (Figure 2).

[0020] Earth contact 23 projects axially from sleeve portion 25, on the opposite side to flange portion 26, and gripping members 14 comprise a number of cut-out flexible tabs 28 arranged in a ring, extending from flange

portion 26 to sleeve portion 25, projecting radially and axially from flange portion 26 towards sleeve portion 25, oriented away from fluidtight terminal 3, and sloping with respect to the axis of symmetry of ring 12a so as to inter-ferentially engage, in use, a lateral surface of body 6 of fluidtight terminal 3, as shown clearly in Figure 3.

[0021] Peripheral edge 27 of seat 15 is preferably provided with a number of coupling members 30 for at least angularly engaging tabs 28, and which, in the example shown, are defined by radial recesses or radial projections arranged in a ring and which cooperate with cut-out tabs 28 to secure container 10 to ring 12a.

[0022] Ring 12a thus acts as an effective, reliable mechanical coupling member between container 10, supporting electric component 2 for assembly, and body 6 of fluidtight terminal 3, fixed integrally to casing 7. Member 12 therefore provides for securing container 10, and any elements connected to or housed inside it, to casing 7, with no need for conventional brackets (Fusite guards), while at the same time earthing casing 7 by means of contact 23.

[0023] In conjunction with ring 12a, component 2 (and any other electric components) is also secured mechanically and connected electrically to fluidtight terminal 3 by electric and mechanical coupling members 31 provided on contacts 20, and which, in use, engage pin contacts 4 when these are inserted inside through holes 21.

[0024] Coupling members 31 comprise respective bulb ends 32 bent at a right-angle to the predominant extension direction of contacts 20 (parallel to the axis of symmetry of ring 12a, in the example shown). Each bulb end 32 has a through perforation 33 defining on it at least two flexible tabs 34 (Figure 3) for inter-ferentially engaging a respective pin contact 4. More specifically, through perforations 33 are substantially clover-shaped, so that each defines three flexible tabs 34 arranged in a ring about 120° apart.

[0025] Contacts 20, in turn, are fitted integrally to container 10 in known manner not shown for the sake of simplicity, e.g. are clicked inside seats 35 in container 10 by means of female Faston terminals 36, or are molded onto container 10.

[0026] Container 10 in Figure 1 comprises a cup-shaped body 40 with its concavity, in use, facing away from fluidtight terminal 3; and a lid 41 for closing cup-shaped body 40, and which is fixed to cup-shaped body 40 in known manner, e.g. by means of slits 44 which click onto teeth 45 on the outside of the lateral walls of cup-shaped body 40. Cup-shaped body 40 also has a lateral through slit 46 defined between two appropriately shaped flexible tabs 47 formed in one piece with cup-shaped body 40 and together defining a known cable clamping device 48.

[0027] First seat 11 is designed to expose a face 50 of electric component 2 facing fluidtight terminal 3 in use, so that, in the compressor 5 application, for example, motor protector 2 is in as close and direct contact as possible with casing 7, with no synthetic plastic compo-

nents, such as portions of container 10, in between.

[0028] To assemble electric component 2 easily, seat 11, in the Figure 1 embodiment, is also made accessible through an opening 55 (Figure 2) formed in cup-shaped body 40, on the opposite side to lid 41. Opening 55 is sized to permit bayonet insertion of component 2, on the side of container 10 facing casing 7 in use, and to leave face 50 exposed and substantially flush with a top peripheral front edge of seat 11.

[0029] Seat 11 is preferably defined by an enlargement 60 formed in one piece with cup-shaped body 40 and projecting inside the concavity of cup-shaped body 40, from a bottom wall 61 (Figure 1) of cup-shaped body 40 having seat 15 on the same side as and alongside opening 55.

[0030] Seal 18 is fitted inside seat 15 (Figure 3) to fluidtight seal a gap 70 defined, in the concavity of seat 15, between bottom wall 22 and the inner lateral walls of seat 15, and body 6 of fluidtight terminal 3. Holes 21 and slit 24 (if present) are so located as to be housed inside gap 70 when device 1 is assembled, so as to fluidtight seal contacts 4 and 23 fitted to container 10.

[0031] Seal 18 may be simply assembled within seat 15 (top part of Figure 3) so as to be gripped by insertion of fluidtight terminal 3 inside seat 15, or may be formed (e.g. co-molded) in one piece with container 10, e.g. on bottom wall 22, or with assembly member 12 (bottom part of Figure 3), e.g. on the edge of sleeve portion 25 of ring 12a opposite flange portion 26.

[0032] On the side facing fluidtight terminal 3, seat 11 also has a seal 78 (Figure 2), which cooperates, in use, with electric component 2 for assembly, so as to fluidtight seal Faston-type blade contacts 79 of component 2, formed on the opposite side to face 50, when device 1 is assembled, in the same way as seal 18 with respect to contacts 4 and 23.

[0033] In the Figure 5 and 6 variations, in which any details similar or identical to those already described are indicated using the same reference numbers for the sake of simplicity, respective devices 1a, 1b for assembling component 2 comprise respective containers 10a, 10b, each having a cup-shaped body 40a modified to make seat 11 accessible by simply removing lid 41, i.e. only on the concavity side of cup-shaped body 40a. Obviously, enlargement 60 is eliminated, while opening 55, if provided, provides solely for exposing at least part of face 50, but not for inserting component 2.

[0034] With reference to Figure 6, container 10b of the device according to the invention also houses a known starting device 80 for compressor 5, which, in the example shown, comprises a known PTC pad 81; and two contacts 20a having coupling members 31 at one end and, at the opposite end, known disk terminals 82 connected on either side of pad 81. More specifically, pad 81 and terminals 82 are housed inside an enlargement 85 formed on and projecting from a modified lid 41a of container 10b.

[0035] Starting device 80, be it a PTC pad or relay,

may obviously also form part of device 1. In which case, as shown in Figure 7, lid 41 of container 10 in Figure 1 need simply be replaced with a lid 41a as shown in Figure 6.

[0036] With reference to Figure 8, the Figure 1 device 1, shown assembled in Figure 8, may also comprise a terminal board 100 in the form of a holder 101, molded from insulating material (synthetic plastic) and opening book-fashion on plastic hinges 101a, and which can be located at a distance from fluidtight terminal 3, e.g. simply connected to contacts 20 over at least one electric lead 103. Lead 103 is wired inside container 10, comes out of container 10 through clamp 48, and is connected to and wired conventionally inside terminal board 100 (conventional type), so that, in the case of the compressor 5 application, from terminal board 100 emerge solely a lead 110 to the refrigeration circuit thermostat, a lead 111 to a starting condenser 114 (if any), and a power lead 115 connected to the electricity mains.

Claims

1. A device for assembling an electric component on an fluidtight pin-contact terminal having an electrically conducting body projecting partly outwards of a metal casing, in particular of a compressor; the device comprising: a container made of electrically insulating material and housing said electric component inside a first seat; and an electrically conducting assembly member having a number of gripping members for securing it mechanically to the body of the fluidtight terminal on one side, and to the container on the opposite side; the assembly member being housed, in use, inside a second seat of the container defining a concavity open on the side facing the fluidtight terminal and for partly receiving the body of the fluidtight terminal with the interposition of a first seal; electric contacts being provided, inside the container and at through holes formed through a bottom wall of the second seat, and which comprise coupling members for electric and mechanical connection to the pin contacts, which coupling members engage the pin contacts when the pin contacts are inserted in the through holes.
2. A device as claimed in Claim 1, **characterized in that** said first seat is so formed as to expose a face of said electric component facing the fluidtight terminal in use.
3. A device as claimed in Claim 1 or 2, **characterized in that** said electric component is a motor protector; and said fluidtight terminal is a FUSITE® type terminal.
4. A device as claimed in one of the foregoing Claims, **characterized in that** said assembly member is a

metal ring having a projecting, preferably blade-type, earth contact insertable inside said container through a through slit formed through the bottom wall of the second seat.

5. A device as claimed in Claim 4, **characterized in that** said ring has a substantially L-shaped radial section comprising a sleeve portion, which fits onto said body of the fluidtight terminal; and a flange portion, which extends radially outwards of the sleeve portion, from the end of the sleeve portion facing the fluidtight terminal in use, and which rests axially against a peripheral edge of said second seat.
6. A device as claimed in Claim 5, **characterized in that** said earth contact projects axially from said sleeve portion, on the opposite side to said flange portion.
7. A device as claimed in Claim 5 or 6, **characterized in that** said gripping members comprise a number of cut-out flexible tabs arranged in a ring, extending from said flange portion to said sleeve portion, projecting radially and axially from the flange portion towards the sleeve portion, sloping with respect to the axis of symmetry of the ring, and oriented away from said fluidtight terminal, so as to interferentially engage the body of the fluidtight terminal.
8. A device as claimed in Claim 7, **characterized in that** said peripheral edge of the second seat is provided with a number of radial recesses or radial projections arranged in a ring, and which cooperate with said cut-out tabs to secure said container to the ring.
9. A device as claimed in any one of the foregoing Claims, **characterized in that** said first seal is fitted inside said second seat to fluidtight seal a gap defined, in the concavity of said second seat, between the bottom wall of the second seat and said body of the fluidtight terminal, and which houses at least said pin contacts.
10. A device as claimed in any one of the foregoing Claims, **characterized in that** said container houses a starting device for a compressor of a refrigeration circuit.
11. A device as claimed in any one of the foregoing Claims, **characterized in that** said container comprises a cup-shaped body with its concavity, in use, facing away from the fluidtight terminal; and a lid for closing, and which clicks onto, the cup-shaped body.
12. A device as claimed in Claim 11, **characterized in that** said first seat is accessible by removing said lid.
13. A device as claimed in Claim 11, **characterized in**

that said first seat is accessible through an opening formed in the cup-shaped body on the opposite side to said lid, and is defined by an enlargement formed in one piece with the cup-shaped body and projecting inside the concavity of the cup-shaped body, from a bottom wall of the cup-shaped body having the second seat.

14. A device as claimed in any one of the foregoing Claims, **characterized in that**, on the side facing said fluidtight terminal, said first seat has a second seal cooperating with the electric component.
15. A device as claimed in any one of the foregoing Claims, **characterized in that** said first seal is applied, or is formed in one piece with said container or said assembly member.
16. A device as claimed in any one of the foregoing Claims, **characterized by** also comprising a terminal board in the form of a book-cover holder, and which can be located at a distance from the fluidtight terminal, by being connected to said contacts over at least one lead.
17. A device as claimed in any one of the foregoing Claims, **characterized in that** said coupling members for electric and mechanical connection to said pin contacts comprise respective bulb ends bent at a right-angle to a predominant extension direction of the contacts; each bulb end having a through perforation defining on the bulb end at least two flexible tabs for interferentially engaging a respective said pin contact.
18. A device as claimed in Claim 17, **characterized in that** said through perforation is substantially clover-shaped, so as to define three flexible tabs arranged in a ring.

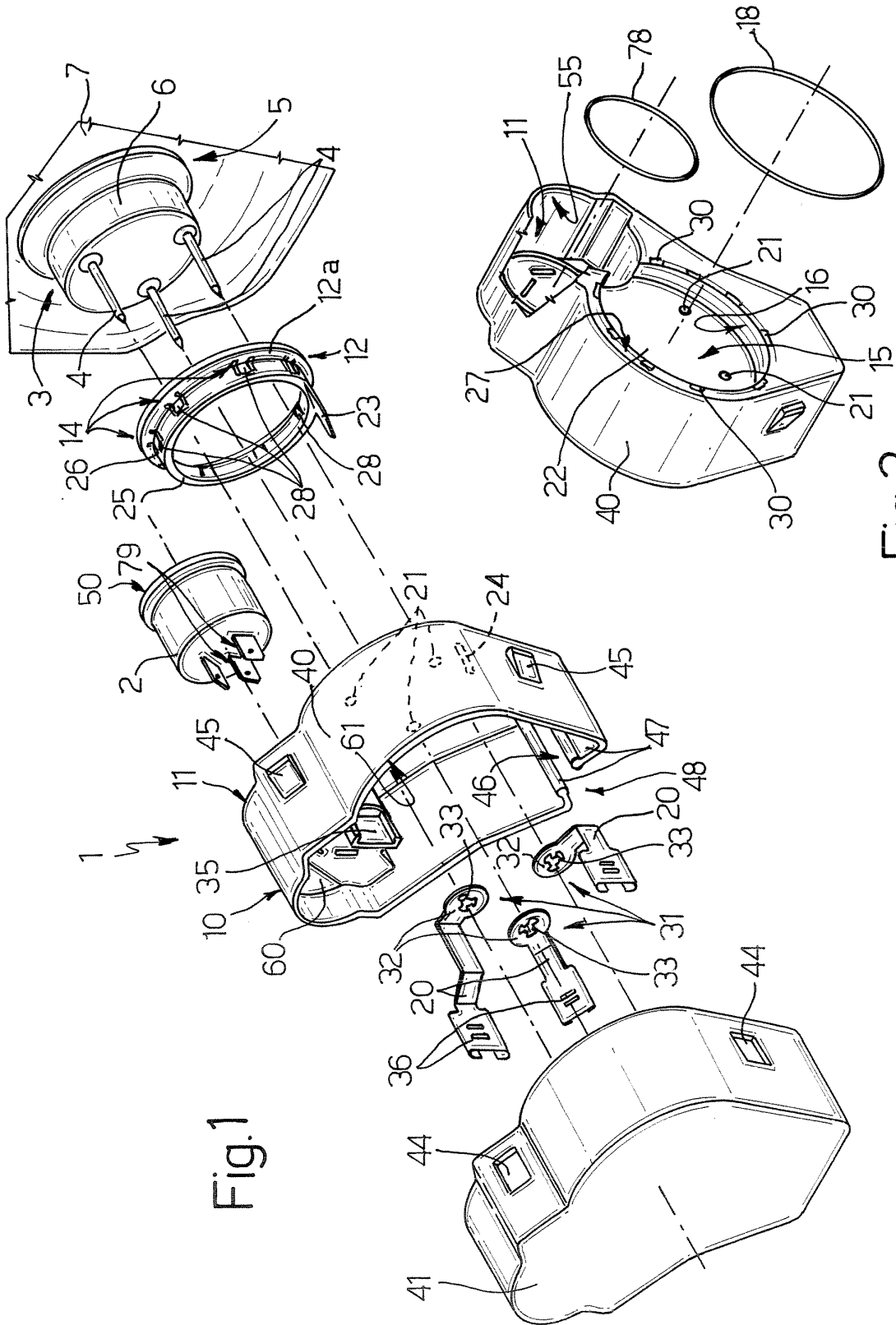


Fig.1

Fig.2

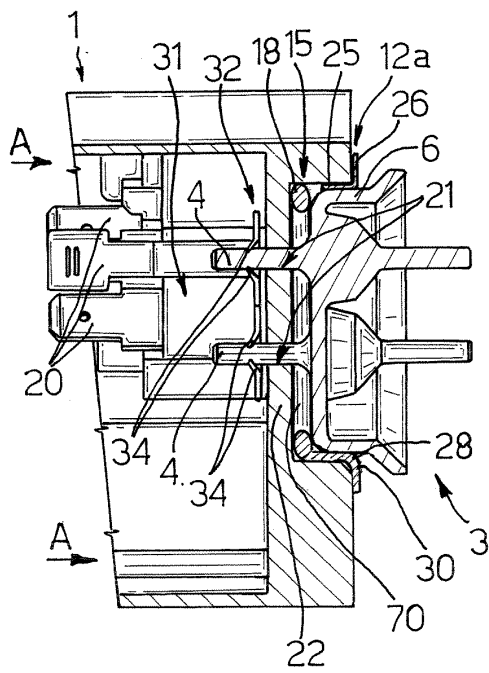


Fig. 3

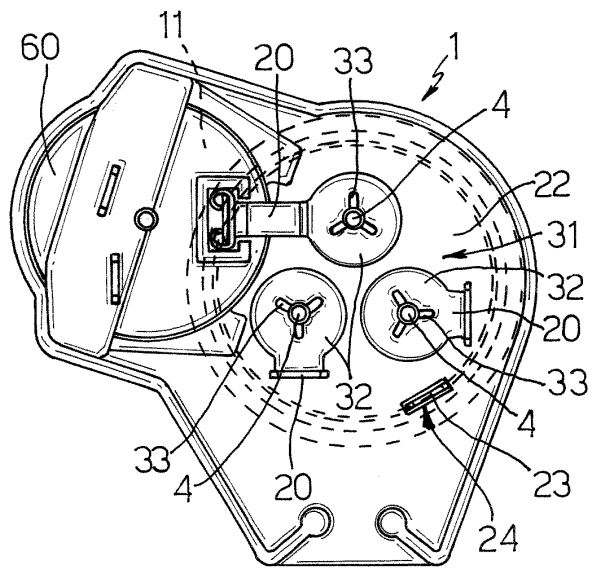


Fig.4

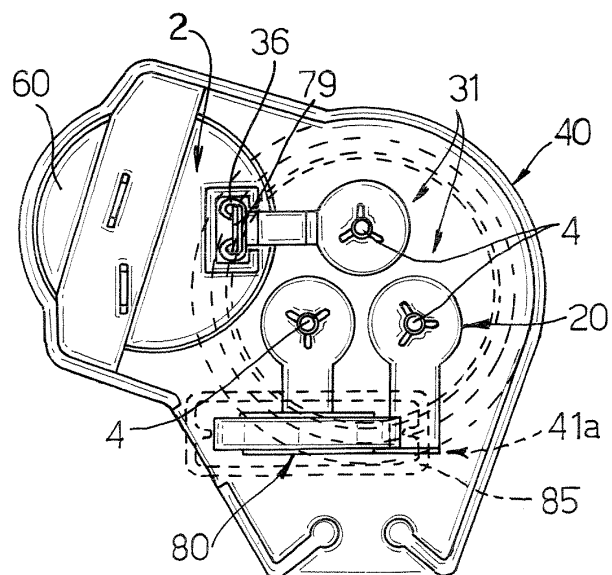


Fig. 7

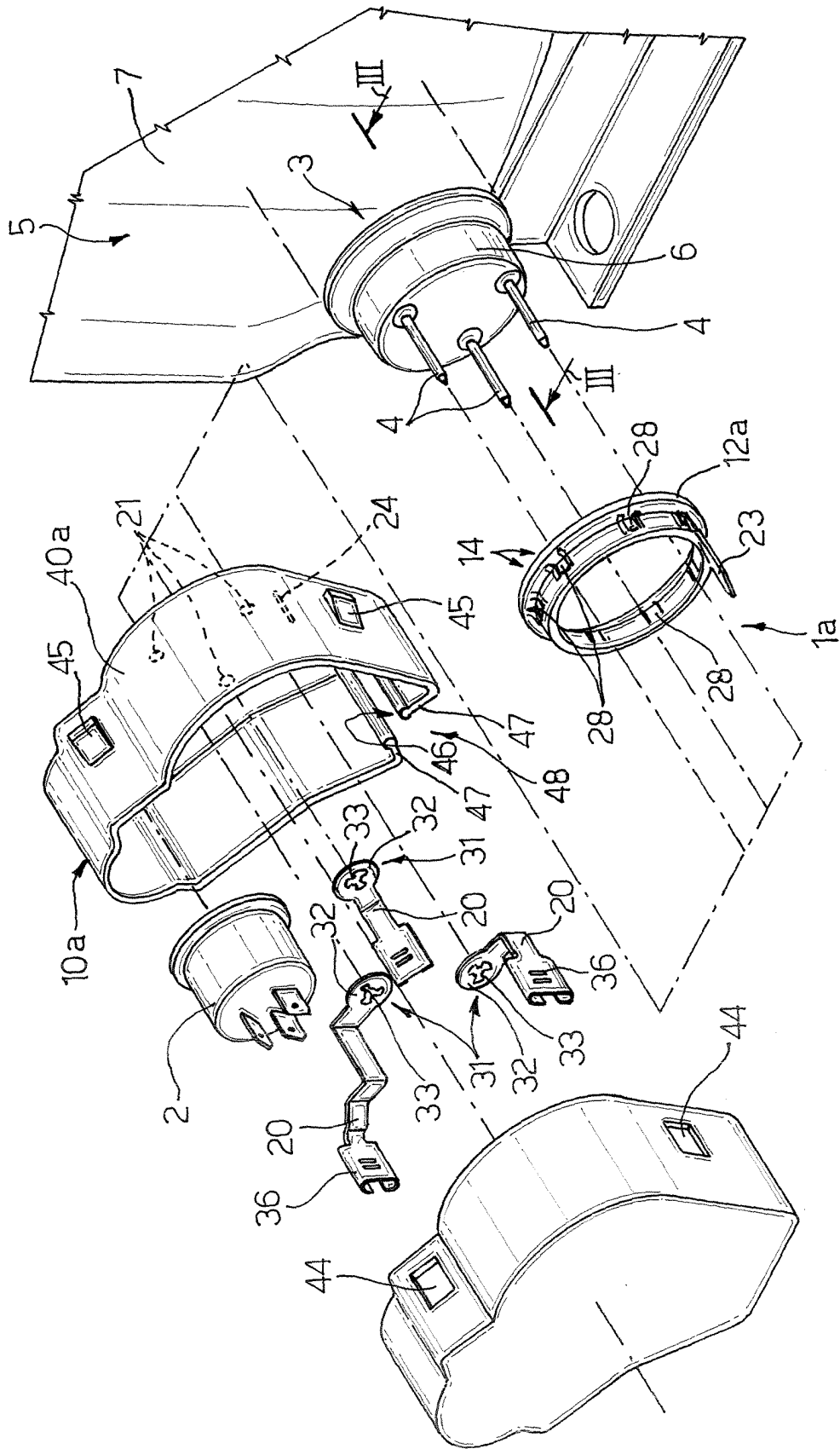


Fig.5

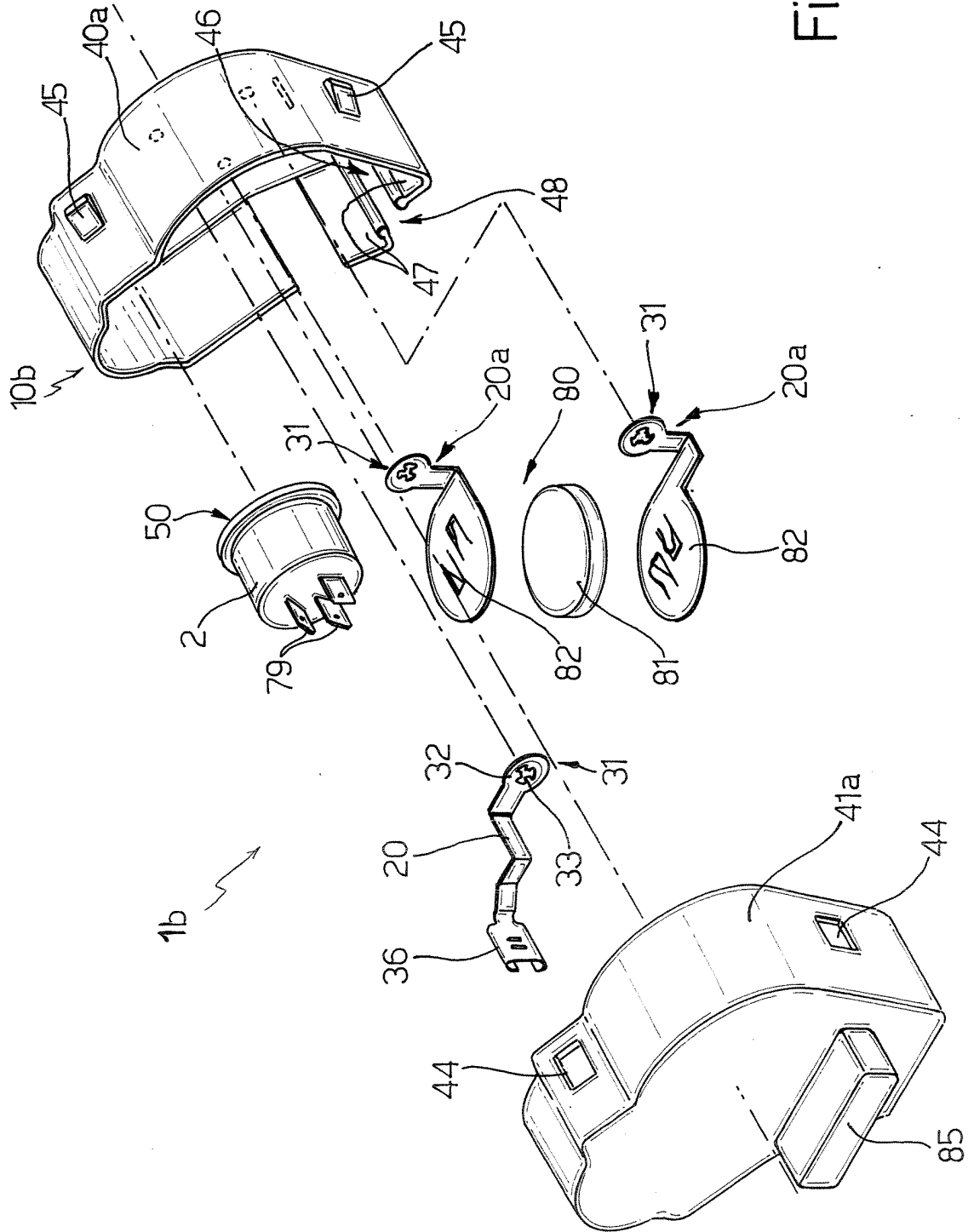


Fig. 6

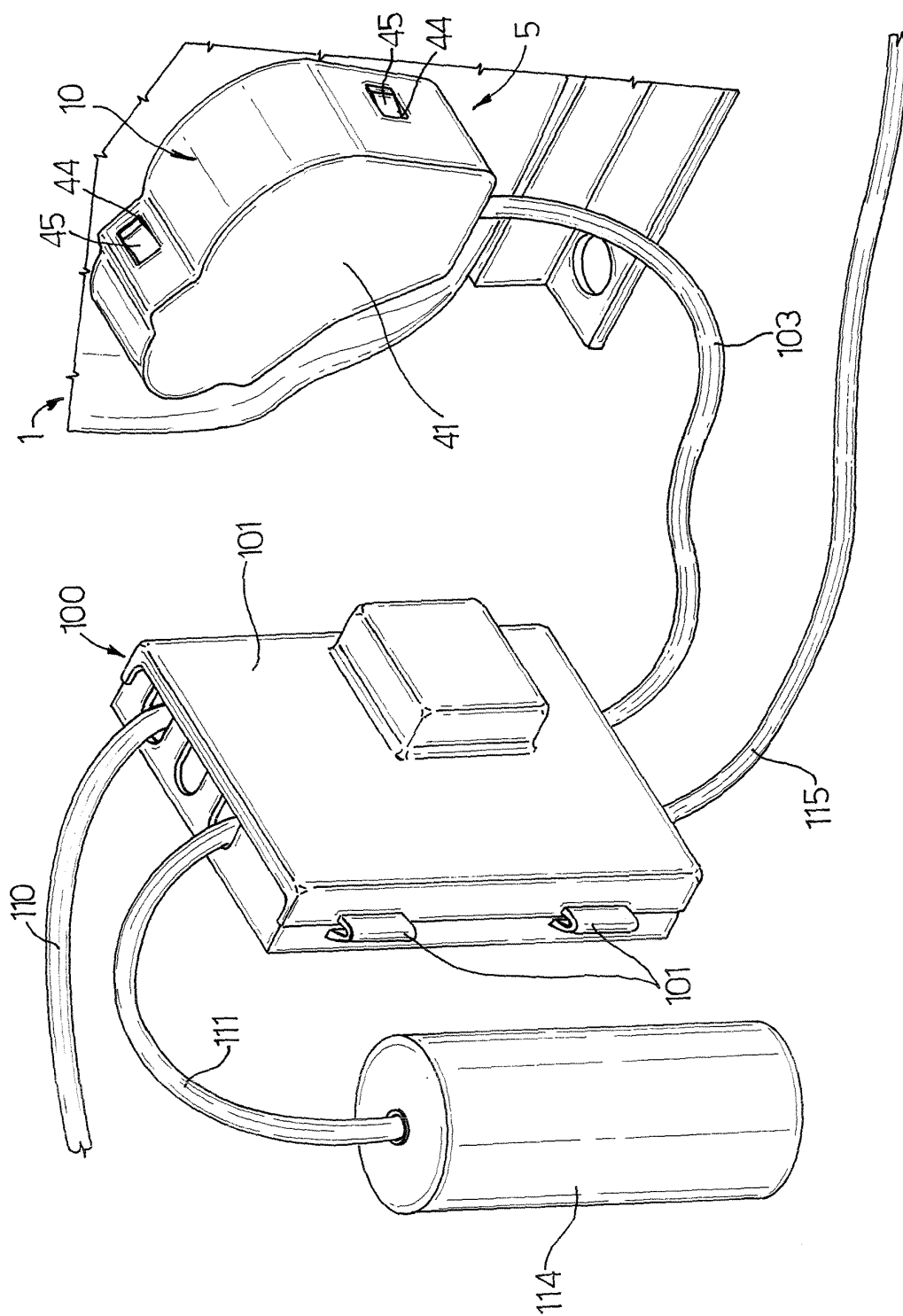


Fig. 8



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 10 7000

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A	US 2002/049004 A1 (DAVIS WAYNE SAMUEL ET AL) 25 April 2002 (2002-04-25) * figure 1 *	1-18	
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		8 November 2005	Demol, S
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EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 05 10 7000

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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